

World-wide Linear Collider Test Beam Needs

September 3, 2004

International Linear Collider Test Beam Working Group

The linear collider lays out formidable challenges, demanding unprecedented detector and beam instrumentation performances to fully exploit its excellent physics potential. To meet these challenges, novel technologies and new techniques and methods have been developed and are close to their maturity, but many of them have not yet been thoroughly tested with actual particle beams. The recent decision by the International Technology Recommendation Panel (ITRP) is an important milestone towards the realization of the international linear collider and sets the time scale for detector development. This time scale demands basic detector design choices to be made within the next few years. The choices, however, cannot be made on a solid footing without significant and timely test beam programs.

One primary goal of the test beam programs is to evaluate the novel technologies for detector and beam diagnostics. A pressing detector issue is the jet energy resolution which can be improved using particle flow algorithms. These require presently unparalleled calorimeter granularity and the knowledge of the evolution of hadronic cascades to a high precision. The present simulation of these cascades is too much model-dependent and not sufficiently verified to serve as a basis for solid optimization of detectors and algorithms. A second important goal is thus the validation and improvement of simulation and software tools.

Nine beam instrumentation, fourteen calorimeter, seven tracking and three muon detector R&D groups are requesting test beam to accomplish their goals. The requirements span from low energy electrons, e.g. for beam instrumentation, to electrons, muons and a variety of hadrons of wide energy range extending from 1 GeV to at least 50 GeV for calorimetry. These groups foresee the beginning of test beam experiments in early 2005 through 2008, requiring a total of over 50 weeks of combined beam time, even with high degree of coordination. In addition, the groups anticipate beam time with less stringent beam requirements for commissioning and will make extensive use of all available facilities.

Only a handful of existing facilities can fulfill the most stringent requirements of particle species, rates and energy ranges. For these facilities, however, the availabilities are rather restricted in the forthcoming few years which are critical for linear collider detector R&D. Either the test beam facilities are not offered or are already allocated for other projects. It is thus clear that even our current demands can not be met, unless appropriate action to rectify this mismatch is taken.

Fulfilling the need for test beam in a timely fashion is vital for the success of the entire linear collider program, but this critical condition is presently not satisfied. Being seriously concerned, the linear collider community approaches ICFA for support. We request the lab directors to officially recognize the linear collider test beam effort and to adjust priorities to meet our needs sufficiently. We also request strong support from the laboratories to provide the necessary infrastructure and resources. We finally ask the lab directors to endorse and assist our test beam related funding requests.